Defining a generic information model for addressing new service offers in a competitiv scenario

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Abstract
Due to the competitive context, the multi-service offers drive operators to rationalize their network management. Proper reference management architecture is a necessary step for deploying an effective management of all types of services that can cope with market necessities and timing requirements. In this paper, we present an overview of the reference management architecture that Telecom Argentina has been devising as a re-engineering effort of its activities and as a next step towards the realization of an adequate information model.

Keywords: Customer/Provider concept, Domains, Management Architecture, Information Model.

1. Introduction

The revision of the strategic missions of telecommunication companies, the efficiency and costs reductions that come from the competitive arena, call for structural that go beyond the mere purchase of management OSS and on-the-shelves management solutions.
Incumbent Telecom Operators, traditionally 'network oriented' have to become more and more 'service oriented'. Therefore Network Management and most of all Service Management have to be enhanced to take this new orientation into account.

Devising management processes and locating them within a proper reference management architecture - with the definition of interfaces, guidelines and rules for their proper utilization - is an additional necessary step for an effective management of all types of services that can cope with:

- market necessities and timings,
- flexibility and scalability,
- applications developments cost reduction.

And as a following step, the Information model in the Telecom companies has to be more and more service oriented, requiring extensions to the TMN information model.

This paper is structured as follows. Starting from a simplified TINA business model, the description of the reference management architecture is outlined, applying the customer/provider paradigm. Furthermore, a simplified example of an information model is depicted as an illustration of such a concept. Finally the conclusion emphasizes the methodology currently used in Telecom Argentina for the first repository specification that implements these information model concepts within the management architecture framework defined.

2. From a business model to a management referenc architecture

2.1. A simplified TINA Business Model

The TINA Consortium has addressed the need for recognizing and identifying business models that well fit with the current and evolutionary market situations [TinaSA]. In the definition of the characteristics and of the components of a service architecture flexible enough to anticipate future needs, a business model has been introduced. A primary important characterization to be accomplished is the definition of the user and provider paradigm that has been recursively and deeply adopted for categorizing the roles that distinct actors can play within a business scenario.

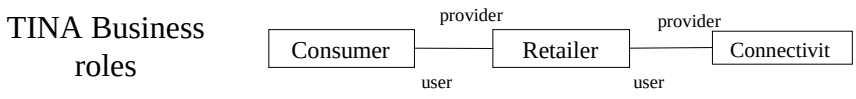

Figure 1: The simplified TINA business roles

2.2. The Telecom Argentina approach

Although the original user provider paradigm has been devised for representing roles within a multi-stakeholders scenario (where distinct actors/companies are involved) it is still possible to retain some of its general principles and adapt it within the context of a single company. The inter-company relationships model is being related and adapted to an intra-company model, where the previously identified domains are represented, in place of distinct companies.

We have to remark, however, that it is not claimed that the interfaces and the components identified in the TINA service architecture have been applied. In fact, in the service architecture the focus is more on the access and usage aspects of a service, rather than on the organizational issues. Customers access to service management functionalities is also outlined, but with more emphasis on the dynamic aspects involved within a service session (e.g. the definition of a management context, and the Terms of Management) [TinaSA].
As depicted in Figure 1, from the TINA business model the consumer (who uses services), the retailer (who provides customers with service access and supports in provisioning), and the connectivity provider (who manages a network) have been identified as the main actors.

3. Telecom Argentina's reference management architecture

The objectives of the definition of the reference management architecture [RefArch] can be briefly summed up as follows:

- to satisfy quality of service requirements as being perceived by the final customers (availability, performance, …) and as regulated by the contracts issued;
- to anticipate customer claims on service or network failures;
- to reduce operation and maintenance costs, as well as time required and expenditures for new services introduction.

The activities that allow fulfilling these objectives are transversal among different business principals of the enterprise, and are supported by a set of co-ordinated internal processes. These organizational units is structured as in the TMN model [M.3010][M.3100][M.3400].

3.1. Representation of the architecture in terms of domains

Telecom operators' Network management systems have to cope with distinct network technologies, several service types, and different organizations involved in provisioning and managing services itself.
Therefore the separation of the architecture in distinct domains with clear interfaces between them permits assuring the flexibility with regard to the organization and be prepared to offer unbundling services to others operators (for example SS7 services or last mile services).

Each domain provides services to customers and is itself a customer with respect to the service providers, where internal/external refers to the enterprise administrative domain. In the architecture, the customer can be an external customer or an internal customer (for instance, a Business Unit of the company can be a customer of services of other Business Units). For the same reason, a provider can be internal or external.

Therefore, the generic enterprise is represented as divided into distinct domains. Each one is responsible for managing services provided by internal or external providers and its proper resources (if any). Each domain has internal and/or external customers.

The following figure presents the concept of domain.

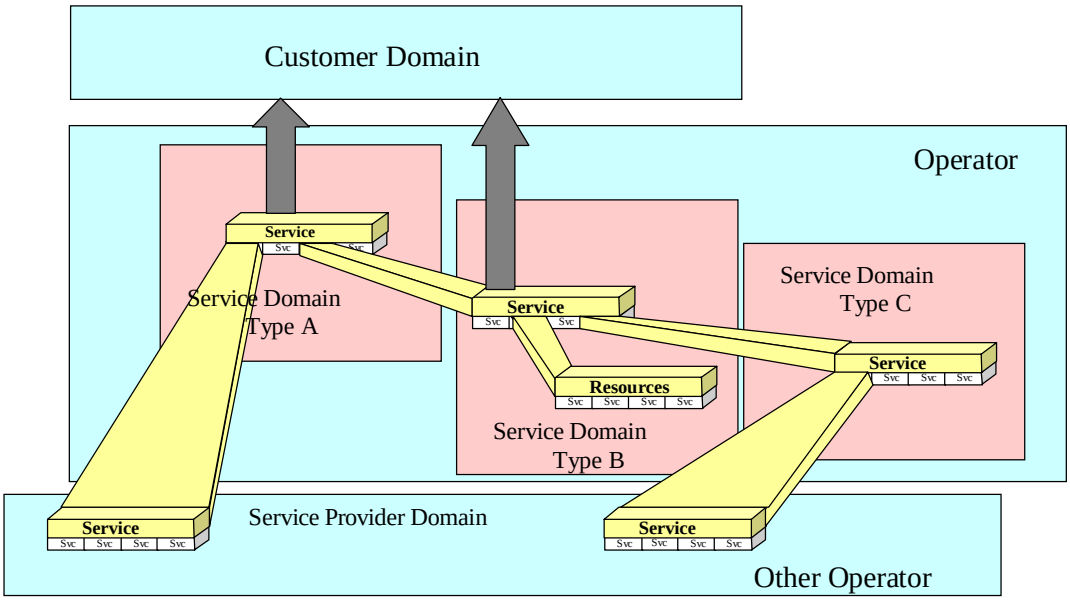

Figure 2: The domain concept

Three precise types of domains have been identified (names are indicatives):

- Domain A type makes use of **services coming from other domains** and combining them in order to provide an integrated service to external customers.
- Domain B is similar to the A one, but it **makes use of its own network** resources.
- Domain C is similar to the B one but with the difference that **it only deals with internal (inter domain) customers** and it has no contact with external ones.

In a generic Telecommunication Company, a mix of the three types of domains can be instantiated.

Each domain of the operator integrates services from others domains (internal or external provider domain) to provide a service to another domain (internal or customer domain).

There are 3 types of service integrated by a service domain as illustrated in Figure 2:

- a service provided by an external domain,
- a service provided by an internal domain (type B or C)
- a service provided by the domain itself with its own resources.

The services offered by a single domain are telecommunication services as well as management services. Interactions among distinct domains are ruled by norms according to the service characteristics, by means of contracts or SLAs (Service Level Agreements) [NMF].

By mapping these 3 domain types onto the simplified TINA business model we obtain the following representation.

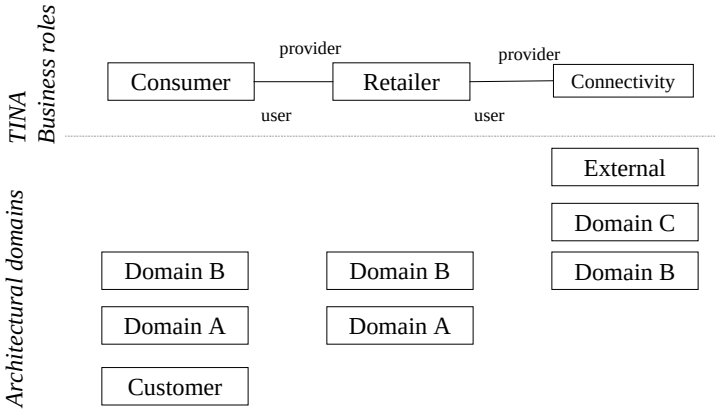

Figure 3: Relationships among TINA business roles and service domain types

The entities recognized within the reference architecture have been mapped onto the different business roles, being possible that a single domain plays more than a role at the same time. For example, the C Domain plays only the role of a connectivity provider because it doesn't offer any management services to external customers; whereas the A Domain is at the same time a customer (of other internal units) and a retailer, offering to the customers an access point at the service management level.

From a management perspective, the scenario depicted in Figure 3 is illustrated in the following scheme.
Indeed, in Figure 4 a diagrammatic representation of the overall decomposition of the enterprise is given in terms of interacting domains, with their relationships. The role of the service management appears clearly and is described in the paragraph 3.2.

It's worthy to note that two distinct layers are identified: a technical management layer dealing with the proper management operations (OSSs), and a commercial management layer which is the reference point for all business management interactions (from customer care to billing, etc.) with external customers (BSS). In the remainder of the paper emphasis is put only on the technical management layer.

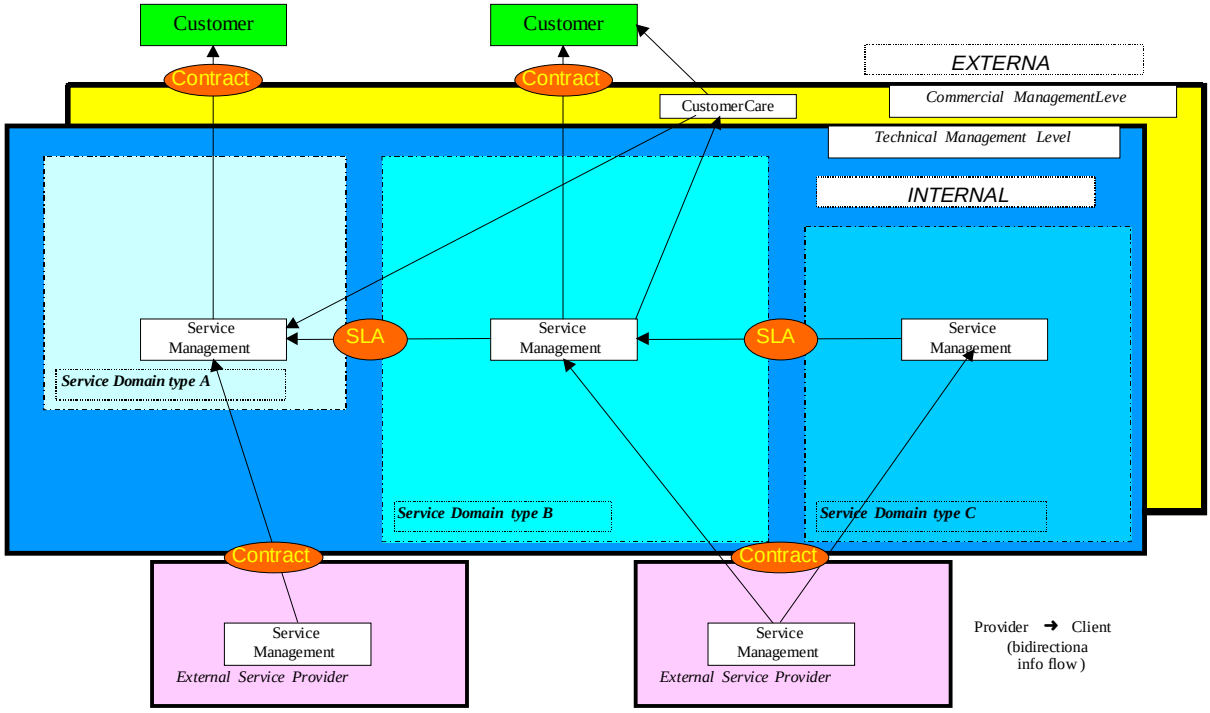

Figure 4: View of the generic reference management architecture

The compliance of the proposed reference management architecture with the TMN principles [M.3010] can be traced in the following aspects:

- each domain is structured according to **TMN logical layers** : (network element, network element management, network management, service management);
- it requires **open standard interfaces**: interfaces must respect the defined standards, and occasionally proprietary ones can be accepted, requiring that they are open fully documented;
- it previews **management functional areas**: management systems will offer functionalities according to the categorization (Fault, Configuration, Accounting, Performance, Security) defined in TMN specifications;
- it supports an **information model**: the TMN object oriented approach for data management and interchange with other systems will be supported;

As depicted in Figure 5, a reference information model transversal to all the management layers and shared among all the business divisions is being introduced hereafter. This will reduce integration efforts required when delivering new services.

Trouble ticketing, work-flow and work-force systems are auxiliary functionalities that will allow supporting processes spanning across distinct business divisions.

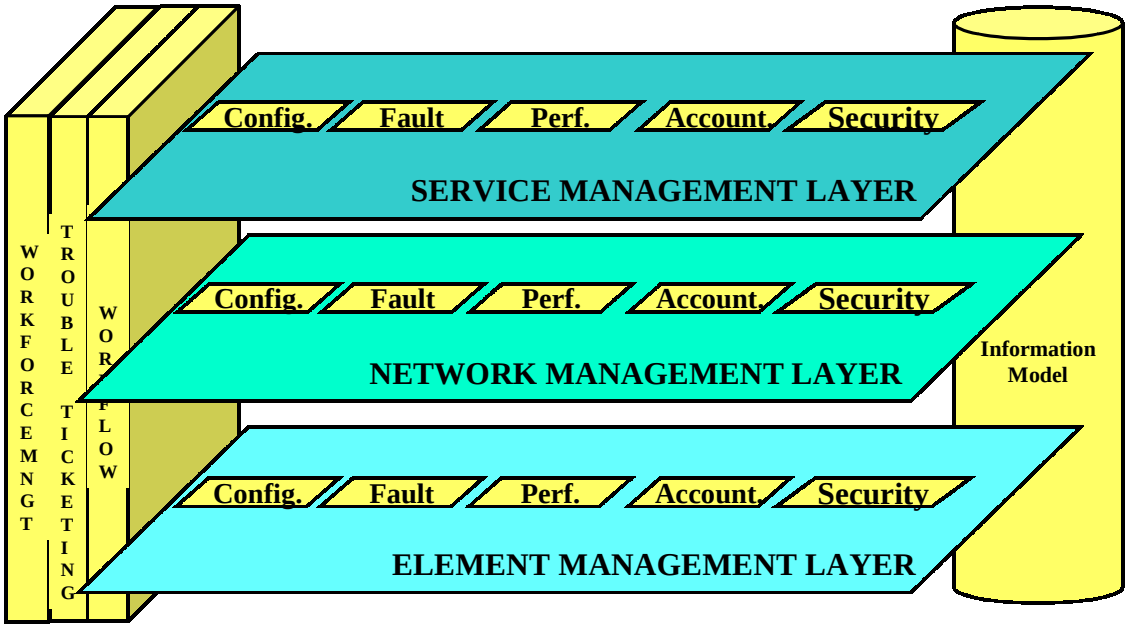

Figure 5: A common data model and supporting tools among management layers

3.2. Access to service management functionalities

In each domain, it is indeed possible to identify the functional layer decomposition of the TMN approach. The reference management architecture provides guidelines on how the distinct business domains within the company have to interact one each other, and how external service providers and users provide or use the services offered by the company.

All the interactions among domains are executed by their respective service management functions (see Figure 4). There are two different modes for accessing to the management services by the customers (being them internal or external):

- The direct mode (e.g. by means of a remote supervision terminal),
- The indirect one, by means of the customer access point.

An operator, with the help of communication systems (e.g. mail, Web technologies [SMART]) realizes this function.

From a functional point of view, service management is a set of functions that complies with the following tasks:

- to combine a variety of service and network management services in order to offer managed services to the customers;
- to provide access to the service management key objective (service delivery and assurance) to external or internal (e.g. another domain) clients, and to the customer care (commercial level);
- to check SLA indicators from both customer and provider side in a objective way;
- to interface among domains and the external contexts

From the schema of Figure 4, different types of interfaces can be identified. They represent interaction points among the internal domains as well as with the external context, i.e. customers and other service providers :

- The first type of interface is among the company and external entities: the contract represents the formalization of such collaboration at service management level with an external entity (i.e. customers or external service providers). Technical information (e.g. expected QoS) as well as juridical aspects are declared in the contract. The following interfaces can be recognized in the entities represented in Figure 4: between clients and the customer access point or service management (for domains of type A and B); and between the service management access points of the internal clients (i.e. all the domains) and the external providers.
- A second type of interface occurs between the technical management level and the commercial one. The customer care interacts only with the service management or with the customer access point of the domains (only for types A and B).
- The last type of interfaces is among the management layers (service and network, network and network element) within the same domain: they are not directly involved with interactions with customers (and for the sake of simplicity, they are not depicted in the diagram).

As far as internal domain interfaces are concerned, they are occurring at level of customer access points and service management. They are regulated by SLAs representing the formalization of the collaboration of the technical management levels among the internal domains [NMF].
Each SLA describes the service type and its technical characteristics with respect to the technical management (e.g. alarms, quality of service, configuration parameters).
Each SLA attribute can be objectively measured, and the creation of a new service must be accompanied by the creation of a corresponding SLA model.

4. An example of a generic information model

4.1. Principles and structure

The purpose of the Telecom Argentina information model is to describe the information entities (information elements and relationships) needed for resource management functions. This model is independent of the architecture of the individual management functions. It is a generic or common information model, that, by the way, sustain communications and relations among the different blocks, layers and interfaces of the referential architecture
It describes connection-oriented and connectionless networks abstractly in terms of network elements, aggregations of network elements, the topological relationship between the elements, end-points of connections (termination points), and transport entities (such as connections) that transport information between two or more termination points. In addition, this information model also defines management support objects for any management application, and defines the service and business views.

The Telecom Argentina information model is a generic model derived from the generic models proposed by standards, in particular ITU-T GNIM [M.3100] that models a network element, ETSI GOM that models a network, and TINA NRIM [NRIM] that models a multi-network (interconnection of networks that belong to different network operators) and some aspects of services. It also includes classes defined by the Omnipoint model to cope with the Service and Business Management Layers.

The model is composed of a number of fragments, each fragment describing a certain subject area. This grouping is done only for documentation purposes. Representing the whole information model as a single object model would not have lead to its understanding. The fragments and the sections that describe these fragments are listed below:

- Network Fragment (Topology of a network)
- Managed Element Fragment (Topology of a network element)
- Connectivity Fragment (Connectivity within a service, a network or a network element)
- Termination Point Fragment (Terminations points of any connectivity or topology)
- Management Support Fragment (Support resources for management applications)
- Service Fragment (Topology of a service)
- Business Fragment (Business entities)

From the different fragments that make up the generic information model, one can note that TAGOM contains three types of management information :

- *Technical information* (topology, connectivity) on services and networks
- *Administrative information* (management support) on services and networks
- *Business information* (business) on customers and services

The next section shows the service fragment as an illustration of the principles used.

4.2. Service Fragment

The service fragment contains all entities that represent the service topology.
We differentiate *client services* from *services*. A client service is a commercial offer. A client service may consist of other client services. This class is therefore recursive. For example a client service entitled “High speed Internet Access” may be constituted of the client service “High Speed access” and of the client service “Internet Access”. A PABX-to-PABX 2 Mbit/s client service, may be seen as being an aggregated client service which contains the client services “detailed billing”, “2 Mbit/s PABX-PABX connectivity” and “service supervision”.

A service is another entity which is a network service supporting a client service. There are client services that do not have any counterpart in terms of services (e.g., detailed billing). There are client services that translate into network services; the client service “2 Mbit/s PABX-PABX connectivity” translates into the service entitled “2 Mbit/s point-to-point link”.

A client service belongs to a *client service type*. Instances of the class client service type constitute the client services catalog which consists in all commercial offers.
Similarly, a service belongs to a given *service type.*

The class service represents a generic service. This class needs to be specialized for specific services (e.g., transport service, IN service, etc). Similarly, the class service type is a generic class that needs to be specialized for different types of services (e.g., transport service type, IN service type, etc.).
It is an *internal client* (e.g., Large Account) that defines the service types. An internal client assigns one or several *contacts* for each service type. These contacts play the customer care contact. If an end customer (called external client) detects a problem while using his service, he may call the contact for some help or information.
Both client service and service may be deployed over 0 to N *locations*. As examples, a leased line is deployed over two user locations to connect those locations while an Intelligent Network service is deployed over 0 locations.
In the case where the service is deployed over some locations, the service is served by a service trail. A service trail is an end-to-end connectivity between two user end-points. This *service trail* relies on one or several network trails.

The reader is cautioned that the snapshot presented in figure 6 is a simplified model.

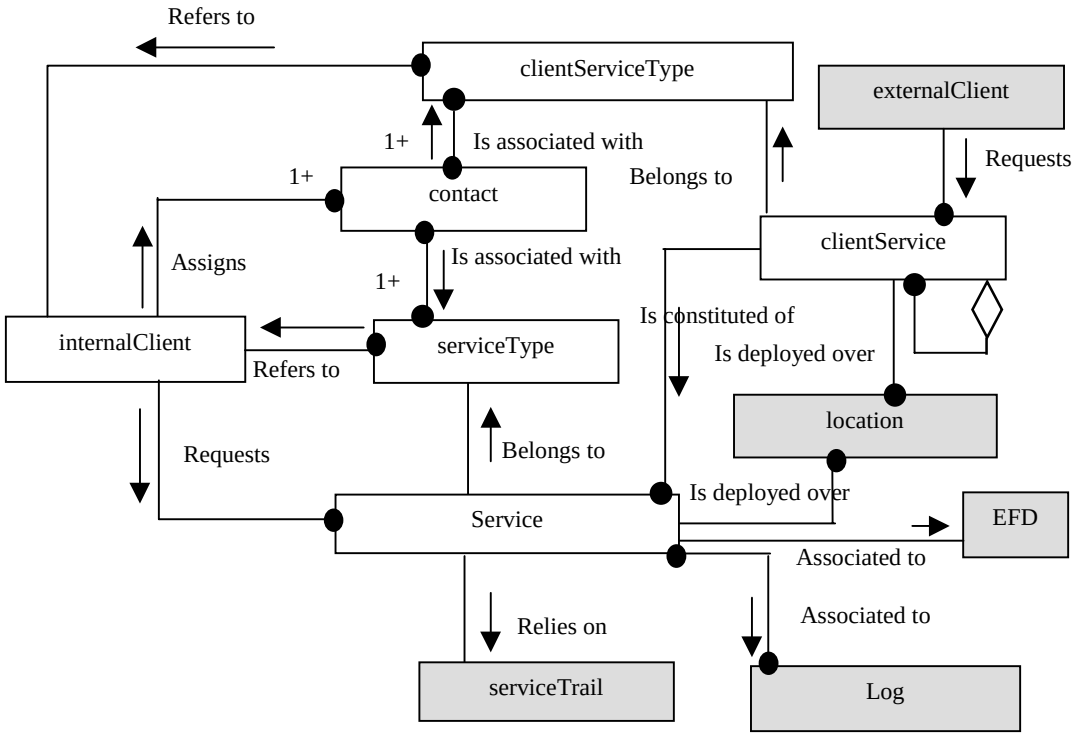

Figure 6 : Service Fragment

5. Conclusions

The management architecture concepts and the information model sample illustrated in this paper are the results of an ongoing activity being carried out within Telecom Argentina aiming at defining a common architectural framework for the service management activities and an optimal data management.
This effort has been based on the need of a generic information model for managing efficiently networks and service resources.

Telecom Argentina realized the project to address data modeling issues and structured a method to achieve it in three phases:

1. **Definining a Generic Data Model for Telecom Argentina (TAGOM)**, considered as a reference model for the company. It represents all resources to be managed at the business, service, network and network element management layers.
2. **Specializing TAGOM** for every service type and network technology. The result of this phase is a set of specialized models described using UML (Unified Modeling Language) [UML] notation.
3. **Mapping the UML library of specialized models** obtained in the previous step against the specification of the data model of each OSSs project highlighted in the architectural framework, in an homogenous way.

The two first phases are already done, and the third one is “in course”. This last phase is not expected to finish soon since evolution of legacy OSSs or specification of new ones are never-ending issues.

One of the first applications of this work has been the design of a data repository that will store the network element, network and service resources involved in the provisioning and the quality assurance of business services.

This first implementation proves the effectiveness and usefulness of having defined a management architecture framework and a generic information model to achieve a coherent and efficient information system.

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